KENNECOTT GREENS CREEK MINING COMPANY
GENERAL PLAN OF OPERATIONS

APPENDIX 11
ATTACHMENT B
SITE SPECIFIC PLAN
SITE 23

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1.0 INTRODUCTION

The operation and maintenance of Production Rock Site 23 (Site 23, Figure 1) is based on the Decision Notice, Finding of No Significant Impact issued by the Forest Service in December 1992 for the Environmental Assessment For Additional Waste Rock Disposal Capacity at Greens Creek Mine, Admiralty Island National Monument, Alaska (EA) and plans approved by the Forest Service for construction of the site. The EA Decision Notice approved the use of approximately 18 acres for the placement of approximately 1.2 million cubic yards of production rock at Site 23. The Forest Service previously approved the use of approximately 8 acres at Site 23 for this same purpose in the 1983 Final Environmental Impact Statement Notice of Decision for the mine. Since completion of the EA, KGCMC has decreased its estimate of production rock generation for the remaining currently approved life of mine. Current plans call for placement of 660,000 cubic yards of production rock on 14 acres.

KGCMC's intent is to conduct operation and maintenance activities in accordance with applicable Best Management Practices (BMPs) established in the Forest Service Soil and Water Conservation Handbook (FSH 2509.22).

1.1 Regulation

Production Rock Site 23 regulatory oversight is the responsibility of the Forest Service with respect to land, lease and operational issues. Oversight for point source water discharges is the responsibility of the U. S. Environmental Protection Agency with accompanying Alaska Department of Environmental Conservation certification; non point source discharges are regulated by the Forest Service as specified in the Company's General Plan of Operations, Appendix 1, Freshwater Monitoring Plan. Kennecott Greens Creek Mining Company's Operations and Maintenance Plan for Site 23, in conjunction with the engineering and construction planning, will meet all appropriate regulatory compliance standards. A solid waste permit covering Site 23 is being developed by ADEC. The O&M Plan will be amended to meet permit or regulatory standard changes per KGCMC application and agency authorization.

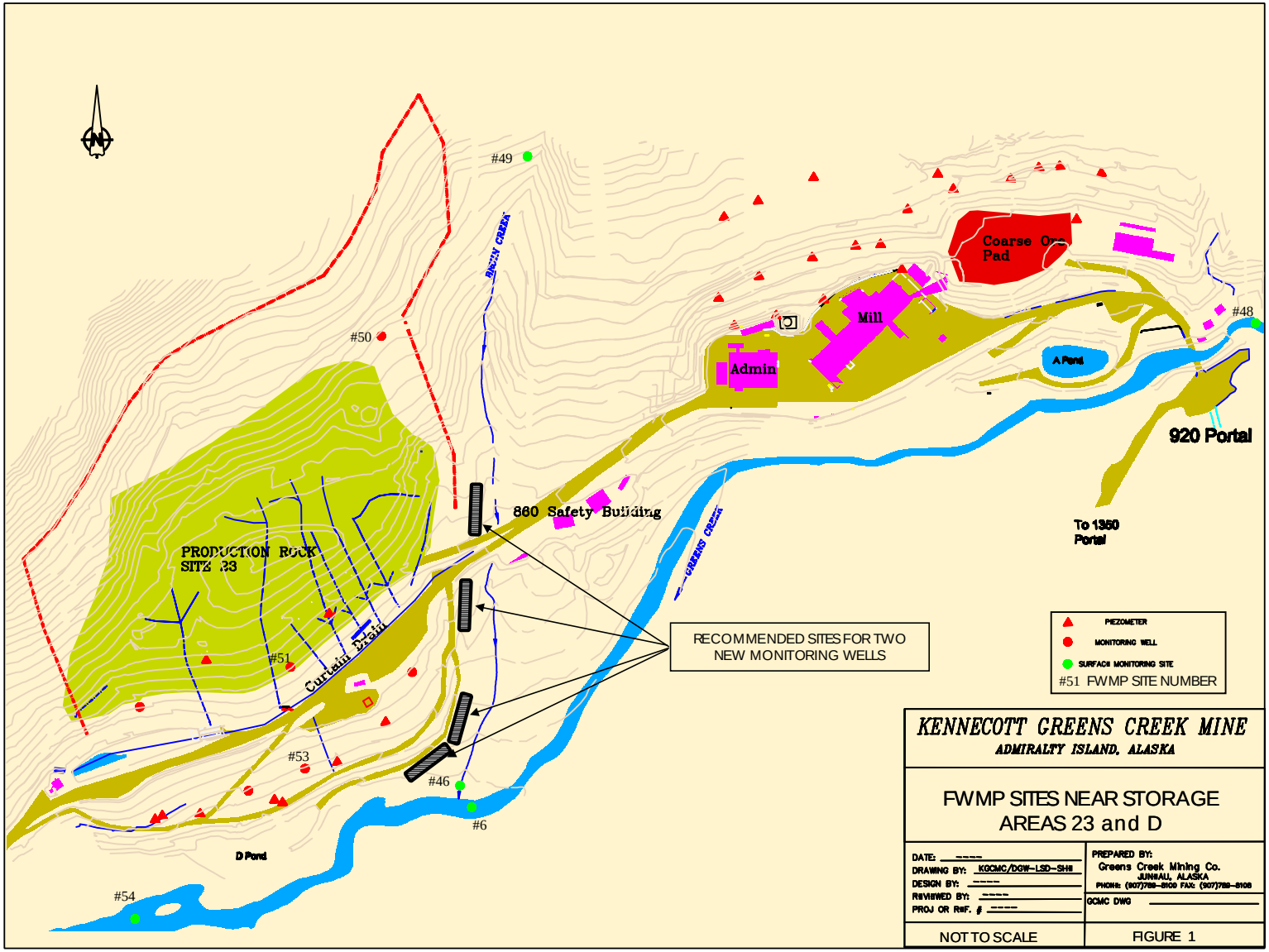

Figure 1. Layout of the Site 23 Production Rock Pile (map to be updated by KGCMC, to be provided as replacement page.)

1.2 Scope

This document describes the operations and maintenance plan for Production Rock Site 23.

1.3 Management Objectives

Kennecott Greens Creek Mining Company will manage Production Rock Site 23 to maintain pile stability and water quality standards while planning for a return of the land to natural use with a minimum of post closure effort. The Company will achieve its management objective by employing proven practices, building on methods developed through on-site experience and establishing techniques and/or procedures matched to the unique geochemistry and climatic combination of the local (Greens Creek) environment. In addition to the common production rock management objectives, KGCMC will incorporate the following objectives into the Site 23 O&M plan:

- Layout of the site to facilitate early sediment control revegetation followed by reclamation efforts including topsoil/till cover placement and a longer term revegetation program; and

- Incorporation of best contemporary practices through staged development plans.

2.0 SITE OPERATIONS

Site 23 operational procedures include all common production rock guidelines in addition to the site specific guidelines discussed here.

2.1 Ground Preparation

2.1.1 Stumps and Brush

All stumps and brush will be cleared from the site in advance of production rock placement. Stripping will be in accordance with staged site development presented in this plan. Initially, KGCMC plans to burn stripped stumps and brush on the Production Rock Area. Placement of tree stumps and other stripped materials in areas other than on site burning will be approved by the Forest Service in advance of action. When operationally feasible, KGCMC will utilize the site's organic materials for reclamation.

2.1.2 Tills and Topsoils

KGCMC intends to utilize tills and topsoils excavated from Site 23 for placement of a cap (cover) as the site develops. Excess soils and tills may be available for reclamation projects at other mine site locations (production rock sites, quarries, laydown areas). Utilization of Site 23 materials for this purpose will be approved in advance by the Forest Service. KGCMC will also contour the original ground and utilize native materials to facilitate groundwater management.

2.2 Construction Methodology

2.2.1 Overview

Production rock piles will be developed using an ascending construction method. This method of construction is preferred because:

- Each successive lift is supported on a previously constructed lift whose behavior is likely to be reasonably well understood;
- Any potential failure surface which could affect more than one lift must develop through the previous lift which also acts as a buttress for foundation soils; and

- The toe of each successive lift always is in contact with the level surface of the previous lift thereby providing greater stability than if the foundation surface were sloped.

Production rock deposition occurs at a rate that avoids the development of excessive pore pressures in the underlying soils and the placement rock, which could cause the pile to be unstable under either normal (static) or earthquake (dynamic) conditions.

Production rock placement began after timber clearing, relocation of the "B" Road segment below the site, stripping, installation of monitoring wells and piezometers, and construction of water management system features. KGCMC manages groundwater via subdrains, drainage layers, curtain drains and/or diversions as conditions warrant. Gradual site preparation will occur in advance of production rock placement as the site develops.

KGCMC recontoured and compacted original ground, installed a network of subdrains, and placed a 6-12 inch limestone basal drainage layer to ensure proper management of hydrologic conditions encountered at the toe of the pile (below elevation 920'). The recontoured and compacted ground serves to direct water to the subdrain system and minimizes infiltration below the pile. The basal drainage layer also acts as a high permeability zone for potential water transport.

The subdrains are enveloped in filter fabric and consist of 2-6 inch drain rock and six inch perforated HDPE pipe. The drains are 5-8 feet in width, 1-2 feet thick, and are spaced 50 to 100 feet apart depending on surface topography and hydrologic conditions encountered. Each drain has a set of fingers which radiate diagonally upslope and are constructed to the same specifications as the main drains but do not contain the HDPE pipe. Drains on the western half of the pile are lined with HDPE membrane for the last 50 to 100 feet to preclude infiltration into the fill from curtain drain and pond construction below.

The need for such aggressive water management measures upslope is not anticipated because the water table is significantly deeper (> 25 feet) at higher elevations. Although limestone was utilized at the base of the pile, KGCMC may use other drain material as the pile develops. To date, there is inconclusive evidence to support effective use of coarse limestone within drains for acid neutralization.

2.2.2 Surface Operations Construction Methodology

Placement areas will be developed according to construction plans approved by the Forest Service. Practices common to all active production placement areas are based on overall management objectives. The following provides a listing of common surface operational practices:

Each lift will be developed over the largest possible working surface of the site and to allow as much time as possible between successive lifts. Raising portions of the production rock pile significantly higher than adjacent areas will be minimized depending on the available tonnages of each type of production rock material. The top of the production rock pile will be graded or crowned to prevent water from collecting and potentially infiltrating the pile. Accumulated ice and snow will be bladed off of the top of the site immediately prior to the placement of production rock.

2.2.3 Design Slopes and Benches

The production rock pile on Site 23 will be constructed with an overall slope of 2.85H:1V. The final slope gradient and benches will be designed during final closure.

2.2.4 Site Access

An access ramp to the site begins near the west of Bruin Creek at the 900 foot elevation level. The ramp runs from east to west and is extended as production rock placement proceeds and the site ascends the slope. The ramp will be 20 feet wide with a maximum 12 percent grade. While no switchbacks in the access ramp are planned, safety will be the primary consideration in determining whether to install a switchback in the ramp. A maximum 12 percent grade on the ramp will be acceptable for personnel and equipment safety, provided that trucks do not meet on the ramp during winter when road conditions may be slippery from ice and snow. During the winter, the access ramp will be graded and sanded regularly to minimize accumulations of ice and snow. A three-foot high berm will be maintained on the outside edge of the access ramp and traffic will be managed to provide for safe site operations.

2.2.5 Production Rock Placement

Production rock will be placed on the site using an ascending construction method starting from the "B" Road. A truck will haul the production rock onto the site and dump it in the proper spot as defined in Common Section 3.3. A bulldozer will spread and compact the rock onto either the natural ground, in the case of an initial lift, or the surface of the previous lift. The production rock will be compacted in thin layers. The initial layer of production rock and successive lifts will be approximately one to two feet thick, composed of layers as required to achieve the desired compaction and infiltration. In cases where the material is greater than two feet in diameter, larger lifts may be required.

Production rock deposition will occur at a rate that avoids the development of excessive pore pressures in the underlying soils and the waste rock, which could cause the waste rock pile to be unstable under either normal (static) or earthquake (dynamic) conditions.

Each lift will be developed over the largest possible working surface of the site and as much time as possible will be allowed between successive lifts over the site. Raising portions of the production rock pile significantly higher than adjacent areas will not occur.

The top of the production rock pile will be graded or crowned to prevent water from collecting and to decrease the infiltration rate. Accumulated ice and snow will be bladed off of the top of the site immediately prior to the placement of production rock.

2.2.6 Production Rock Compaction

Visual observations indicate that fines and surface compaction from equipment movement cause the top of production rock sites to have relatively low infiltration rates. Infiltration tests conducted during Spring 1994 in holes dug at a limited number of locations on existing production rock sites "D" and "E" showed infiltration rates of from 1.1 to 6.0 inches per hour (4.2×10^{-3} to 8.0×10^{-4} centimeters per second).

KGCMC's goal is to reduce water infiltration into Site 23 as much as possible. To meet this goal, KGCMC will target a compaction specification of 90 percent of the site material's Proctor

density for production rock placed on the site. Compaction effort will be in accordance with the following procedural method developed from compaction/infiltration tests on mine production rock. After placement and initial compaction with the bulldozer when the material is spread, KGCMC will make a minimum of two passes over each layer of production rock using a Caterpillar CS 563 or equivalent self propelled vibratory compactor.

2.2.7 Production Rock Classification

KGCMC will utilize a numerical system for production rock classification and placement. The production rock pile will be constructed using zoned placement of material. The material that is potentially more acid-generating will be placed in the interior of the pile while non-acid generating production rock will be used to construct the outer five (5) feet of the pile's shell. Trucks dumping on Site 23 will place materials according to their classification in locations designated by signs placed on the rock pile. The operator will indicate where to place the material and will spread and compact the rock as described above.

2.2.8 In Situ ARD and Metals Leaching Treatment

KGCMC has investigated the effectiveness and feasibility of implementing an in-situ treatment process to reduce ARD potential and metals leaching from Production Rock Sites (Condon 1999). The process entails application of a polymer that binds soluble zinc, with or without application of lime limestone for pH control. The treatment process has been proven to be effective for specific short-term applications as a means of reducing the mobility of zinc. The treatment has not yet been shown to be suitable for long-term control of ARD or metals leaching. Consequently, polymer and lime limestone will not be added to the production rock pile on a routine basis. If particular zones within the production rock piles require treatment to control the release of metals become acidic before an engineered cover can be placed, then polymer and limestone may be added as a spot treatment to control zinc release.

2.3 Pond/Water Operations

KGCMC will inspect the pond with respect to operational guidelines on a daily basis. Records of these inspections will not be retained unless an operational problem is encountered and action necessary.

2.3.1 Pond Underdrain

KGCMC has designed the pond underdrain system in accordance with BMPs recommended by the EPA. The underdrain will serve to maintain low pond level conditions during periods of nominal flow. Operators will be responsible for verifying the drain function (flow) on a daily basis.

2.3.2 Decant Riser

The decant riser has been designed to allow for increased pond discharge during storm events. Operators will be responsible for verifying that the decant riser is clean and functional on a daily basis.

2.3.3 Pump Station

Water level management will be achieved through automation of the wet well pumps including variable speed drives, an engineering feature to reduce the on-off cycle frequency of the main wet well pumps, and level controllers. Specific level control elevations will be confirmed after pump station commissioning and performance review. The pump station control elevations are provided as preliminary:

- High Level Warning 882'
- Initiate Pump(s) Cycle 879'
- Complete Pump(s) Cycle 873'

The systems will be set to maintain the pond at as low a water level as possible without exceeding the rated pump/pipeline capacity. Process instrumentation will transfer water management information (flows and levels) to the mill operations control room for on-line review and operational actions. The pumps will not require adjustment during high runoff conditions but incorporation of high level alarms will ensure pump operations.

2.4 Winter Operations

Seasonal adjustment is an important component of the operations and maintenance of Site 23 systems. Winter operations are especially important and to ensure operator understanding, the winter protocol is clearly communicated.

2.4.1 Snow Removal

Snow will be removed from the working bench area in advance of production rock placement. The accumulated snow load will be plowed down slope from the working area. Slope snow loads judged to be excessive would be hauled to an alternative location.

2.4.2 Roadway Safety

The access to Site 23 will be graded and sanded as necessary to provide safe road conditions for truck traffic.

2.4.3 Water Systems

Water systems including diversion ditches, collection ditches, pond inflow/outflow and pump station inspection frequency will increase as weather conditions merit. Conditions requiring supervisory attention will be reported prior to initiation of corrective actions. Pond snow removal is not planned nor will the pond be used for snow storage.

2.5 Emergency Action Plan

The emergency action plan procedures are common to all production rock placement areas, active and inactive.

2.5.1 Production Rock Spills

In the event of a production rock spill (large quantities of unintentionally deposited production rock), the truck driver would notify their supervisor by radio and summon assistance.

2.5.2 Localized Movement

In the event equipment operators observe small localized movement, they would contact their supervisor and move equipment away from the area in question. KGCMC will notify the Forest Service and ADEC of the movement and undertake corrective action to stabilize the area.

2.5.3 Mass Failure

In the case of mass failure, equipment operators will immediately move to a safe site, contact their supervisor and, if safe, move all equipment from the site. KGCMC environmental personnel will immediately advise the Forest Service and ADEC of the extent and nature of the problem.

Working closely with the Forest Service, KGCMC will develop a Forest Service and ADEC approved plan to:

- Stabilize and revegetate failed slopes and rebuild any damaged water management system components;
- Retrieve and replace material that slid from its original location, especially material that has entered a watercourse;
- Stabilize and revegetate failed material that cannot be retrieved and is not in a watercourse;
- Assess and correct detrimental water quality and riparian habitat effects to affected watercourses; and
- Modify the site design or operating procedures or both to avoid a repetition of the problem.

KGCMC will maintain 1,500 feet of 8-inch diameter replacement waste water pipeline to repair or replace damage in the vicinity of Sites 23 and/or D, the pipeline between Pond A, and the 23 pump station is and will remain 8" HDPE. KGCMC will also inventory lesser amounts of 10"

HDPE, about 300 feet. Both products will be stored at the Hawk Inlet warehouse or possibly Pit 5. As the situation warrants, KGCMC will allocate mine haulage and loading equipment to provide assistance at the affected site. In extreme circumstances, KGCMC will use an incident command system (ICS) to direct resources until the situation is controlled.

3.0 SITE MAINTENANCE

By design, maintenance of the production rock pile is intended to be minimal. Regular maintenance work will consist primarily of grading the access ramp and removing accumulated ice and snow, as needed prior to placement of production rock. Other maintenance work will involve the water management system and continued revegetation as the site develops.

3.1 Water Management System

Periodic maintenance of water management system features, including vegetation, sediment pond cleanout, and slope stabilization will occur as needed. Mine personnel will make daily observations of the system (more frequently during heavy storm events) and will respond rapidly to repair damages caused by storm events or other actions. As the site and the water management system develop, mine personnel will periodically re-evaluate the system components and performance to determine if improvements are needed or if other modifications of the system are warranted. Maintenance recommendations will be included in the annual monitoring reports to the Forest Service and ADEC.

3.1.1 Sediment Settling Pond Cleaning

Pond cleaning is needed periodically to remove collected sediment. This maintenance work requirement will be determined each spring and the Forest Service informed. Actual work will be scheduled when relatively dry weather is predicted for several days.

Sediment cleaning will commence before the pond utilizes the designated sediment storage capacity. Sediment level will be monitored annually (after the two characteristic high runoff seasons in spring and fall). As the pond storage limit is approached, the pond will be dewatered during a low runoff period. Dewatering will be accomplished using surface drainage and underdrain systems. The dewatered sediment will be allowed to drain to obtain a stable and workable consistency. To protect the liner and underdrain integrity, the pond will be surveyed and cut-staked so that only the required amount of sediment is removed. A small front-end loader ("Bobcat"), backhoe, or suction dredge will be used to remove the sediment. Access will be by way of the ramp constructed at the east end of the pond. The ramp is designed to protect

the liner system and provide a rip-rap running surface for the loader. To limit trips up and down the ramp, the sediment may typically be moved to a point where the backhoe can load it into a transport vehicle. KGCMC will sample pond sediments and determine the proper handling and/or disposal method. Two options are available: haul to coarse ore pad for mill feed, or transport to tailings for impoundment. Sediment suitability tests, based on size, will be conducted if the removed sediment is planned for use on production rock site revegetation projects.

3.1.2 Diversion Ditches and Water Collection Channels

Maintenance of the diversion and collection channels will be performed as needed to keep water flow in the ditches and channels from being impeded by accumulated debris or sediment and to repair erosion damage.

3.1.3 Pump Station

Routine maintenance of pump station components will be performed based on equipment manufacturers' specifications or recommendations and as identified by routine monitoring inspections.

4.0 SITE MONITORING

4.1 Site Stability And Construction Design Monitoring

KGCMC will monitor conditions at the Site 23 to confirm that:

- The site is constructed according to approved construction plans;
- The site is maintained in a stable condition over the short and long term;
- The area around the site is stable over the short and long term;
- Water management system components are effective and maintained in a stable condition; and
- Water quality objectives outlined in the General Plan of Operations - Appendix 1, Freshwater Monitoring Plan are met.

Monitoring actions will consist of visual observations, piezometer data, and survey data. After the site reaches its final approved design capacity, regular site monitoring will continue by the mine staff or an approved geotechnical consultant until the Forest Service and ADEC determines the site is stable and monitoring is no longer needed.

4.1.1 Visual Observations

KGCMC will conduct a visual inspection of the site once per month looking for cracks, bulges, and signs of stress. Particular attention to the site will be paid in the spring. When appropriate, photographs of the site will be taken. KGCMC will maintain a written record of the inspection findings. In addition, equipment operators working at the site will make frequent, regular visual observations during the course of their work at the site to check for cracks, signs of distress, or production rock and soil movement.

4.1.2 Piezometer Readings

Pairs of pneumatic piezometers, consisting of one piezometer in the foundation material and the other near the bottom of the production rock pile, have been installed in active sites. Once

installed, the piezometers will be read monthly from April through October and once a month from November through March. After one year, piezometer readings will be done on a monthly basis. Piezometric readings greater than 20 percent (20%) above the previous reading (provided the initial reading is above 1.0 psi) will be assessed by geotechnical personnel. KGCMC will provide the Forest Service and ADEC with an annual graph that plots the piezometric readings for the site.

If any piezometer reading indicates a pressure increase greater than 20 percent from the previous reading (provided the initial reading is above 1.0 psi), KGCMC will:

- Immediately conduct an analysis to determine the reasons for the increase;
- Stop all work in the area until the pressure subsides to a normal level;
- Check the reflector points/survey hubs at the site to determine if movement of the rock pile has occurred.
- Contact the Forest Service and ADEC.

4.1.3 As-Built Surveys

As-built surveys, using a conventional transit and level coupled with permanent on-site monuments, are an essential component of the monitoring program to detect potential large scale movements of the pile face or the surrounding ground. As-built surveys will include ground preparation modifications as well as drain, piezometer and well locations.

Reflector points will be established in a series of about 4 lines, on approximately 200-foot centers, oriented in a north-south direction on the face of the pile. Because the production rock pile will be constructed in an ascending sequence, the placement of survey hubs on the pile slope will not interfere with subsequent construction of the pile. The reflector points will be established in a manner that makes them relatively insensitive to movement from subsequent work on the production rock pile. The development of benches will facilitate the installation and operation of reflector points on the face of the pile. For example, the rods on which the reflectors are mounted could be set in concrete footings that are buried below the surface of a

bench or the reflectors could be set in large boulders placed on the benches. Survey control of these lines will be maintained by points east and/or west of the site.

Periodic surveys of these lines would be used to detect potential large-scale movements of the face of the rock pile or the surrounding ground. The frequency of surveys will depend on the rate of site construction. During the period from about July 1994 to the end of 1995, the site will be surveyed quarterly. Thereafter, the lines on the pile will be surveyed semi-annually. Further reductions in the survey frequency may be proposed in time. All survey records will be maintained by surface engineering.

4.2 Environmental Monitoring

4.2.1 Internal Monitoring Program Purposes

The Freshwater Monitoring Plan (GPO Appendix 1) was established to monitor the environmental performance of the facilities during operation. Monitoring sites have been established to periodically measure surface and groundwater quality outside the perimeter of Site 23. Measurement and evaluation of hydrologic and geochemical processes that occur within the Production Rock piles is conducive to better understanding the behavior of Site 23 and its potential interaction with the environment. Consequently, a Production Rock Internal Environmental Monitoring Program (PRIEMP) will be conducted for this purpose. It is important to remember that water quality data collected as part of the internal monitoring program represent “mine water” that is contained, collected and treated prior to discharge under a NPDES permit. As a result, data are not to be compared to compliance levels established for ambient surface and groundwater adjacent to the site.

Hydrologic and geochemical processes are important factors that define the success of the management of the production rock pile. Operational techniques and closure approaches were designed to prevent acidification, minimize infiltration of oxygen and water, and to reduce metal loading from the facility. Short-term control of metal loading relies on minimizing ARD and metal release and on the collection and treatment of contact water. Long-term control measures

will emphasize the minimization of acidification, oxidation, and infiltration of meteoric water. As a result, PRIEMP will provide information about the following:

- geochemical behavior of production rock placed in Site 23; and
- collection of data that will allow development of a mass load model for Site 23 that describes the movement of meteoric water through the pile, and the chemistry of pore fluids contained in the production rock pile.

4.2.2 Geochemistry of Production Rock

The net neutralization potential (NNP) and the paste pH of materials within Site 23 will be measured on samples that are collected from representative locations within the facility. The sampling and testing requirements are outlined below.

Each calendar year that the mine is active, a minimum of 24 samples of production rock will be collected for analysis of NNP. Approximately equal numbers of samples should be collected twice annually. Samples should be collected from an active placement area (not a sideslope) and should consist of a composite sample taken from the top 12-inch depth. Samples should be equally divided between the shell area and the interior of the pile. The sample location (in mine coordinates and bench elevation), date, and the prescribed production rock type for the sample location should be recorded. Static tests will be determined using the modified Sobek Method used for analysis of prior samples (1994 and 1999 grab samples). The NNP will be calculated on the basis of the Sobek acid neutralization potential in tons per 1,000 tons as calcium carbonate minus the non-sulfate sulfur (pyritic sulfur found by summing the nitric acid extractable and the residual S fraction) times 31.25.

Each calendar year until final closure of Site 23, a minimum of 32 samples but not less than 1 sample per 1 acres from the uncovered sideslope of Site 23, will be collected for analysis of paste pH. Samples should be aerially distributed across the facility with samples collected from portions of the facility that vary in age. The samples should be collected as composites from the top 6-inch depth. The location (mine coordinates and elevation) of each sample will be recorded.

One of every 8 paste pH samples will be randomly selected to be analyzed for NNP value. Additionally, each sample with a paste pH of less than 6 will also be analyzed for NNP values.

All results will be provided in an annual monitoring report submitted to the USFS. Data will be graphed in a manner that compares the ANP (x axis) and AGP (y axis) values, and the NNP (x axis) vs. the paste pH (y axis). If more than 10% of the samples placed in the outer shell of the facility are not Type 1 materials, then an action plan shall be developed to improve material handling. Steps contained in the action plan may include but are not limited to an audit of the production rock visual classification and routing program and more frequent verification sampling of Site 23. If more than 10% of the paste pH values are below 5, than an expert in ARD will be asked to review the information, and if necessary, to develop a suitable management plan.

4.2.3 Pore Water Chemistry

Water that contacts production rock is collected and treated during operation of the facility. After closure, surface water will no longer contact production rock as occurs now. Consequently, only interstitial water within the pile will contact mineralized rock. After closure, the long-term net infiltration through the engineered cover will determine the quantity of contact water that may exit the site. The chemistry of contact water is therefore important in determining long-term mass loads of metals that may be released.

Data Quality Objectives

Data quality objectives (DQO's) define the amount, kind, and quality of data that are required to make relevant decisions. In the context of the PRIEMP, data on the chemistry, and, if applicable, flow rate of contact water are required to develop a mass balance model. Additionally, water chemistry data will be used to identify significant trends in the chemistry of contact water. Such trends could reflect changes in the geochemical nature of the production rock by processes such as acidification.

The DQO's developed for the contact water include a constituent list, recommended analytical minimum levels for trace constituents, monitoring frequency, and quantitative limits for precision and accuracy of laboratory data and completeness.

Constituents to be analyzed consist of a series of "indicator parameters" (Table 1). Based on review of existing data from KGCMC collected through the Freshwater Monitoring Plan, some or all of these constituents will always be found in contact waters. Therefore, changes in their concentrations will identify changes in the amount or chemical nature of contact water that is detected at a monitoring station. In addition to the indicator parameters (suite H from the FWMP), common ions will also be analyzed. There are no specific compliance levels for internal sites.

Table 1. Analyte Suites

Suite H		
Conductivity	Dissolved Arsenic	Dissolved Mercury
pH, Temperature[1] & Hardness	Dissolved Cadmium	Dissolved Zinc
Sulfate	Dissolved Copper	
Total Alkalinity	Dissolved Lead	
Common ions		
Dissolved Calcium	Dissolved Magnesium	Dissolved Sodium
Dissolved Potassium	Nitrate plus nitrite	Bicarbonate
Silica	Chloride	

Samples will be collected from each station monthly for surface water stations and quarterly for groundwater stations.

The analytical minimum level is defined as the concentration of a constituent at which it can be reliably quantified according to the precision and accuracy DQO's. Generally, the minimum level occurs at a concentration that is 3.18 times higher than the minimum detection level reported for the method of analysis. The minimum levels for use in the PRIEMP are identified for trace constituents in Table 2. The minimum level is developed by repeatedly measuring low concentrations of the analyte added to reagent grade water. In contact waters, the matrix-specific

ML may be higher than the value in Table 2 due to matrix interference. Such data quality issues will be considered when developing QA/QC reports for the data collected in the PRIEMP.

Precision is a measure of the ability to replicate an analysis and is expressed as the relative percent difference (RPD). The RPD criterion for water samples is ±20% and is only applicable when the analyte concentration is more than 5 times the MDL, and as long as the native amount is not greater than 4 times the spiked amount.

Accuracy is a measure of how close the analytical result is to the true concentration of the analyte, and is expressed as percent recovery (%R). The Matrix Spike/Matrix Spike Duplicate (MS/MSD) criteria are 75-125 %R for all metals. The criteria are only applicable for analyses as long as the native amount is not greater than 4 times the spiked amount. The accuracy limits for the Laboratory Control Sample (LCS) are method dependent.

Completeness is a measure of how many planned analyses for all analytes actually resulted in usable data, defined as all data that is not rejected, and is expressed in percent (%). The completeness criterion is 95% for a water year, which is October 1st through September 30th. Samples that cannot be collected due to restricted winter access or to low flow are not counted as planned samples in the determination of completeness.

Table 2. Recommended Minimum Levels for Trace Constituents

ANALYTE	AWQS[1]	MDL[3]	ML[4]
Arsenic, T, µg/l	50 l	50	160
Cadmium, TR, µg/l	0.52, 0.38	1.0	3.2
Copper, TR, µg/l	5.1, 3.6	10	31
Lead, TR, µg/l	0.90, 0.54	2	6.4
Mercury, TR, µg/l	0.012	0.2	0.64
Silver, TR, µg/l	0.73,0.37[2]	5	16
Sulfate, mg/l	250	50	160
Zinc, TR, µg/l	45.6, 32.7	10	32

T = measured and reported as total, TR = measured and reported as total recoverable

1. If AWQS is hardness dependent, two numbers are listed for the purposes of calculating the ML and MDL. First number listed is based on a hardness value of 37 to represent the 25th percentile of surface water hardness values, the second number listed is based on a hardness value of 25 to represent the 25th percentile of groundwater hardness values. AWQS is for chronic conditions unless otherwise noted. The actual hardness dependent AWQS for that constituent will depend on the actual hardness of the sample, not on the number that appears in this table.

2. AWQS is a 24 hour average (acute).

3. MDL is the minimum detection level for laboratory analysis. The value selected will allow detection of significant changes in the chemistry of contact water.

4. ML based on MDL times 3.18, rounded to not more than 2 significant digits.

Samples from surface water stations will be collected monthly while quarterly samples of groundwater/interstitial waters will be obtained. Samples will be analyzed for the constituents in Table 2. All analyses will be in a dissolved form. The sample collection protocols and the analytical detection levels specified in the Freshwater Monitoring Plan for downgradient monitor wells will be used for analyses of these samples. Sampling sites will include all listed in Table 3.

Table 3. Internal Sampling Locations

Station	Measurements	Frequency	Comments
MW-50	water level and chemistry	quarterly	
MW-51	water level and chemistry	quarterly	
MW-53	water level and chemistry	quarterly	
Each finger drain	flow and chemistry	monthly	Sample when flow exceeds 1 gpm
Each of the 4 curtain drain lines	flow and chemistry	monthly	subject to access to buried lines
Pond D wet well	Chemistry and pumping records, record water level in Pond D, if present	monthly	
Monitor well below B road, between Bruin Creek and Site 23 that was drilled in 2000 and was completed dry (is present)	water level and chemistry	quarterly	sampled if water is present

All water quality data collected will be transmitted in annual reports to the USFS and ADEC. There are no specific compliance levels for these data, but information should be presented on graphs of concentration vs. time to graphically illustrate trends in the data, if any.

4.2.4 Water Flux and Cover Performance

As yet, no significant area of Site 23 has been constructed to final grade. Consequently, with the exception of the first lift of a test cover, engineered covers have not yet been placed over any portion of the facility. When cover is initially placed on the production rock pile, a monitoring plan that measures the performance of the cover shall be undertaken within 1 year of cover deployment. At a minimum, the monitoring plan should allow calculation of the flux of meteoric water and oxygen through the base of the cover into the production rock.

4.2.5 Development and Calibration of a Water Balance/Mass Load Model

After a minimum of 2 years of cover performance monitoring data have been collected, a water balance and mass load model, applicable to post-closure conditions should be developed. The model report should describe the conceptual hydrogeochemical model of the Site 23/Site D area that includes groundwater flow paths, and groundwater/surface water interactions. Also, the mass flux of water and metals out of the reclaimed production rock pile, the fate of constituents along the flow path, and the resultant seasonal concentration of critical constituents in receiving water should be predicted.

4.2.6 Surface and Ground Water Quality Monitoring

KGCMC's General Plan of Operations - Appendix 1, Freshwater Monitoring Plan establishes the protocols for water monitoring at Site 23. The water monitoring objectives for Site 23 include: assurance that appropriate water quality standards are met, ARD activity and management approach are assessed, metals leaching activity and management approach are assessed, and closure plans remain consistent with field conditions/observations. Data trends will assist overall site management plan direction and development. See GPO Appendix 1 (Fresh Water Monitoring Plan) for site summary sheets and monitoring requirements.

4.2.7 Water Management System and Reclamation Monitoring

Waste rock disposal equipment operators will visually inspect the water management system features and ongoing site reclamation efforts on a regular basis. Mine environmental personnel will visit the site at least once each month to evaluate and document the effectiveness of ongoing reclamation efforts and the water management system. Inspections of diversion ditches, collection channels, and the sediment settling pond will include checking that water flow is not impeded by accumulated debris or sediment, erosion is not occurring, and liners are not exposed or damaged. Regular visual inspections of the pump station will be made to determine that components are properly operating. Visual inspections of the site will include making observations to detect oxidation on the surface and adverse effects to vegetation that may indicate development of acid drainage. Form 5.2 will be utilized to record the inspections.

4.2.8 Monitoring Reports

In April of each year, KGCMC will submit an annual report on the production rock site to the Forest Service and ADEC each year that the site remains active. These reports will provide:

- An as-built topographic survey;
- A running total of production rock placed on the site and a current remaining volume estimate;
- A summary of piezometer readings from the site;
- A summary of key observations, problems, and corrective actions resulting from visual inspections, observations, and other monitoring activities; and
- Freshwater reports will be as established in the Freshwater Monitoring Plan.

The annual reports will also contain the following information when applicable: a survey of the sediment pond(s) and site maintenance recommendations, including the cleanout of accumulated sediment from the sediment settling pond; estimates for surface production rock placement, underground backfill placement, overburden stripping and capping volume estimates for the upcoming year. Actual and forecast volumes will be reconciled after the first year.

Monitoring reports will continue on an annual frequency when the production rock site moves to inactive status. In the event of a suspension of operations, monitoring and reporting will continue to reflect the level of site activity, normally equivalent to standard operational frequency.

5.0 FORMS

5.1 Kennecott Greens Creek Mining Company Operator Inspection, Production Rock Area 23

STABILITY	VISUAL		COMMENTS
Cracks	Y	N	
Bulging	Y	N	
Sluffing	Y	N	
Stake Alignment	Y	N	
SAFETY CONCERNS	Y	N	COMMENTS
EQ CONCERNS	Y	N	COMMENTS
Any Actions Taken	Y	N	COMMENTS

NAME _____

DATE _____

5.2 Kennecott Greens Creek Mining Company Environmental Inspection, Production Rock Area 23

INSPECTION AREA	PHOTOGRAPHS		COMMENTS
DIVERSION DITCHES	Y	N	
COLLECTION DITCHES	Y	N	
STEP CHANNELS	Y	N	
POND/LINER(S)	Y	N	
REVEGETATION	Y	N	
WEATHER	Y	N	
EQ CONCERNS	Y	N	

NAME _____

DATE _____